

**Wisconsin Highway Research Program  
Request for Proposal for**

**Evaluation of Design Criteria and Field Performance of Rubblized Concrete  
Pavement Systems in Wisconsin**

**Questions regarding the content of this RFP are due no later than  
5PM (CDT), Monday, December 5, 2011**

**Responses to questions will be posted to the WisDOT Research and Library website  
(<http://wisdotresearch.wi.gov/rfps-and-proposals>) by Monday, December 12, 2011**

**Proposals are due  
5 PM (CST), Friday, January 13, 2012**

**For further information regarding this RFP  
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**Monday, November 21, 2011**

**Researcher Proposal Preparation Guidelines**

WHRP Proposal Guidelines are available on the WisDOT Research and Library website  
(<http://wisdotresearch.wi.gov/wp-content/uploads/WisDOT-Policy-Research-proposal-guidelines-master.pdf>). Please refer to these instructions in preparation of your response.

## **I. Background and Problem Statement**

In 2007, the Wisconsin Department of Transportation (WisDOT) and the Wisconsin Highway Research Program (WHRP) studied the performance and expected life of Hot Mix Asphalt (HMA) pavement over rubblized concrete pavement in Wisconsin in study SPR 0092-05-07, "Guidance, Parameters, and Recommendations for Rubblized Pavements." At the time of this report, the average age of a HMA overlay on rubblized concrete pavements in Wisconsin was 5 years. This initial report stated that "the 22 years service life included in the Wisconsin Facilities Development Manual is considered appropriate until more data become available with time."

Since the publication of the aforementioned research report, there have been reports of tenting, winter pavement distress and construction problems on several rubblized pavements statewide. Research in other states has also raised questions regarding the permeability of rubblized concrete base and has recommended repair of major cracks and distressed joints in the concrete pavement before rubblizing/HMA overlay in order to prevent reflection into the HMA pavement. Current practice in Wisconsin currently does not require repair of these distressed areas prior to rubblization. These potential factors, combined with several years of reduced maintenance budgets has led to several rubblized project receiving premature mill and inlay repairs or in extreme cases full HMA pavement replacement. Conversely, other HMA pavements placed on rubblized bases throughout the state have shown very little distress and are demonstrating excellent performance.

Current WisDOT policy assigns a service life of 22 years to HMA pavements over rubblized concrete. This estimate is derived from a service life of 18 years for conventional HMA pavements and a 25% increase in service life (4 years) assigned based on the assumption that rubblized concrete is performing similar to a drainable base. The wide range of performance observed for in-service HMA pavements placed over rubblized base has created the need to re-evaluate these assumptions in this research project. .

## **II. Objectives**

The objectives of this study are to develop guidance for pre-overlay concrete joint repair and consideration of the rubblized material in pavement design. At a minimum the research will address the following questions:

### **Pre-HMA Overlay Concrete Joint repair:**

- How distressed does a joint/crack in concrete pavement need to be before some sort of repair is necessary before/after rubblization?
- Should distressed joints be repaired before or after rubblization?
- What kind of pre/post rubblization joint repair should be utilized before HMA paving?
- What kind of structural number and resilient modulus values would these kinds of repairs provide?

- How do the repair costs affect the life cycle cost of the pavement system?

#### **Rubblized base material:**

- What should be the structural number and the resilient modulus of the rubblized layer be for design purposes, utilizing both AASHTO 72 and MEPDG design procedures.
- How thick should HMA overlays on rubblized base be, and what should be the minimum overlay thickness, using both pavement design methods listed above?
- Should rubblized concrete be considered permeable? Should a 25% bump in pavement life be assumed, treating rubblized concrete as a drainable base?
- When is a concrete pavement too distressed for rubblization to be a viable pavement replacement option?

### **III. Scope of Work**

#### **PHASE I: Laboratory Testing and Initial Field Evaluation**

##### Proposal:

In the initial project proposal, the research team will be expected to define their draft experimental plan and explain the rationale. The research team should also state as part of this experimental plan, the total number of field projects to be utilized, the amount and types of lab and field testing to be included in the project, and the expected deliverables at the end of the project.

##### **i. Task 1: Literature Review**

Review and synthesis of publications, research reports, and state specifications/design practices related to:

- rubblization,
- permeability of rubblized/recycled bases,
- resilient modulus and structural number of rubblized bases and joint repair materials, and
- performance, design life, and maintenance of HMA overlays over rubblized concrete

##### **ii. Task 2: Develop Laboratory and Field Work Plan**

Based on results of literature review develop a work plan to for laboratory and field testing. The work plan shall address the following items:

###### **a) Field Evaluation:**

- (a) Number of projects: During the first full construction season, it is anticipated that the research team will survey and test at a minimum of 5 construction projects.
- (b) Project Selection: Testing matrix will include areas of the project with full and less than full rubblization.
- (c) Visual Survey: Survey the condition of the areas prior to rubblization and document the joint repair methods used and the associated cost and effort required.

- (d) **Field Testing:** Identify test methods to evaluate the modulus and permeability of rubblized base materials in the field. Modulus values will be used to determine the structural number of the rubblized base material for consideration in design.
  - b) **Laboratory Evaluation:**
    - (a) Define laboratory tests to measure modulus and permeability of the materials sampled from field projects. Results will be used to estimate the structural number for design.
- iii. **Task 3: Conduct Year 1 Field and Laboratory Experiment**  
Work with WisDOT and Technical Oversight Committee representatives to identify projects that meet requirements of work plan, gain access, and conduct testing.
- iv. **Task 4: Interim Report and Presentation**  
Prepare and submit an interim report summarizing the data collected, identifying trends, stating conclusions, and providing lessons learned. The report will also identify research needs for Phase II of the project. Present findings and Phase II work plan to the Flexible Pavements Technical Oversight Committee (TOC). The TOC will make the decision to approve funding for Phase II based on Phase I findings, the potential benefit of continuing with Phase II, and the performance of the researcher.

## **PHASE II: Expanded Field Evaluation**

- v. **Task 5: Year 2 Field Projects and Laboratory Testing**  
Modify the work plan developed in Task 2 using the lessons learned during the first construction season and repeat the testing specified in Task 3 in the second full construction season of the project. At a minimum 5 field projects will be selected and corresponding laboratory and field tests performed.
- f. **Task 6: Final Project Deliverables**
- i. **Draft Final Report:** Submit a draft final report three (3) months prior to end of contract for review by the Flexible Pavements Technical Oversight Committee (TOC). The draft final report will include but not be limited to analysis of results from field and laboratory testing, including statistical evaluation of the results and their significance. Conclusions and recommendations will propose changes to Chapter 14 of the Facilities Development Manual, the Standard Specifications, and/or Construction Materials Manual.
  - ii. **Project Presentation:** The researcher is required to present the findings of the research including an assessment of implementation potential to the Flexible Pavements Technical Oversight Committee.
  - iii. **Final Report:** Revise draft final report based on TOC comments and submit final report to WHP. One electronic copy and 15 hard copies of the report are required

#### **IV. WisDOT/TOC Contribution**

- i. TOC will aid the research team in locating research projects. The TOC will also review the reports and presentations required of this project and offer feedback to the research team. TOC time commitment is not to exceed 40 hours.
- ii. WisDOT Equipment
  - a) Researchers should not assume availability of WisDOT equipment in the proposal. If equipment is donated to the project by WisDOT or another entity, a letter of commitment must be included in the proposal.

#### **V. Other Project Requirements**

- a. Requirements for Laboratory/Technician Certifications
  - i. No special certifications are required as part of this project.
- b. Required travel to fulfill TOC Obligations
  - i. Research is responsible for travel to field projects throughout the state of Wisconsin to complete the research. The researcher is also required to travel to Madison, WI a minimum of two times for the presentations to the TOC during Tasks 4 and 6.

#### **VI. Budget and Time Frame**

- a. Project Duration
  - i. The total duration of the project is 30 months, with an anticipated start date of starting August 1, 2012. The duration for Phase I and Phase II are provided below. The Gantt charts for both project phases are required in the proposal.
  - ii. Phase I: 18 months
    - a) The interim report shall be submitted no later than 16 months after the start date of the contract.
  - iii. Phase II: 12 months
    - a) The draft final report shall be submitted no later than 3 months prior to the project end date.
    - b) The project is considered closed upon submittal of the electronic and hard copies of the final report.
- b. Project Budget: The total project budget shall not exceed \$205,000. The researcher is expected to provide a proposal for both Phase I and Phase II of the project. The funding for each Phase is allocated as follows:
  - i. Phase I: Laboratory Testing and Initial Field Evaluation: \$120,000
  - ii. Phase II: Expanded Field Evaluation: \$85,000
- c. Award of Phase I does not guarantee award of Phase II. The decision to fund Phase II will be made by the WHP Flexible Pavements TOC based on Phase I results.
- d. The researcher is expected to submit the draft final report with quality technical writing and proper grammar. It is acceptable to include a technical editor on the research team to ensure these requirements are met.
- e. Matching funds will not be considered in the proposal evaluation process.

**VII. Implementation**

- a) This study will determine the type of joint/crack repairs are needed in rubblized concrete and the associated costs. It will also update the design life of HMA over rubblized concrete and the permeability of rubblized concrete. Recommendations of this will be used to modify Chapter 14 of the Facilities Development Manual, the Standard Specifications and also the Construction and Materials Manual.
- b) Researcher is expected to communicate the following:
  - i) Potential changes in practice.
  - ii) Benefits in terms of performance and cost savings.
- c) Tools to facilitate implementation.